

# **ELECTRICITY-OPERATED WINDOW BLIND**

## **BACKGROUND OF THE INVENTION**

### **1. Field of the Invention**

5           The present invention relates generally to a window blind and, more specifically, to an electricity-operated window blind, which enables the user to replace the battery set conveniently and safely.

### **2. Description of the Related Art**

10           A conventional electric window blind is generally comprised of a headrail fixedly located on the top side of the window, a blind body (slat assembly or curtain) suspended below the headrail, a motor drive mounted inside the headrail and coupled to the blind body, and a battery set installed in the headrail to provide the necessary working power to the motor drive, for enabling the motor drive to roll up or let off the blind down and to further change the window shading status.

15           Because the blind body is frequently opened and closed, the battery power of the battery set will be used up quickly. Further, due to limited space in the headrail, the sizes of the motor drive and the battery set (the output power of the motor drive and the storage volume of the battery set) are limited. Therefore, the battery set must be replaced with a new one when power low. However, because the battery set is installed  
20           in the headrail, which is located on the top side of the window (at a high place above the floor), the user may be not accessible to the battery set when standing on the floor. Therefore, when replacing the battery set, the user may need to use a ladder or stand means. However, it is dangerous to stand on a raised place when replacing the battery set, and the user may fall to the ground accidentally

## **SUMMARY OF THE INVENTION**

The present invention has been accomplished under the circumstances in view. It is the main object of the present invention to provide an electricity-operated window blind, which enables the user to replace the battery set conveniently.

5           It is another object of the present invention to provide an electricity-operated window blind, which reduces the chance of the occurrence of an accident during replacement of the battery set.

To achieve these objects of the present invention, the electricity-operated window blind comprises a headrail, a driving mechanism mounted inside the headrail, 10 a bind body suspended below the headrail, and a controller. The driving mechanism comprises a power input device for rotation upon receipt of power supply, and a power output device for synchronously rotating with the power input device. The bind body is coupled to the power output device and controlled by the power output device to change window shading status. The control mechanism comprises a suspension rod 15 downwardly suspended from the headrail by a first end thereof, and a controller installed in a second end of the suspension rod. The controller has a battery set electrically coupled to the power input device for providing the necessary working power to the power input device.

## **20   BRIEF DESCRIPTION OF THE DRAWINGS**

FIG. 1 is a schematic drawing showing the basic structural arrangement of an electricity-operated window blind according to the first preferred embodiment of the present invention.

FIG. 2 is an exploded view in an enlarged scale of a part of the 25 electricity-operated window blind shown in FIG. 1.

FIG. 3 is a schematic drawing showing the basic structural arrangement of an electricity-operated window blind according to the second preferred embodiment of the present invention.

FIG. 4 is an exploded view in an enlarged scale of a part of the  
5 electricity-operated window blind shown in FIG. 3.

FIG. 5 is a schematic partial view in section of an electricity-operated window blind according to the third preferred embodiment of the present invention.

#### **DETAILED DESCRIPTION OF THE INVENTION**

10 Referring to FIGS. 1 and 2, an electricity-operated window blind 100 in accordance with the first preferred embodiment of the present invention is shown comprised of a headrail 10, a blind body 20, a driving mechanism 30, and a control mechanism 40.

The headrail 10 is transversely (horizontally) affixed to the top side of the  
15 window (not shown), having an inside space of suitable volume.

The driving mechanism 30 comprises a motor drive 31. The motor drive 31 is comprised of a reversible motor 32 and an axle 33 coupled to the reversible motor 32. The reversible motor 32 is fixedly mounted in the inside space of the headrail 10 at the right side. The axle 33 is axially suspended in the headrail 10, having one end fixedly  
20 connected to the rotor (output shaft) of the reversible motor 32 and the other end pivoted to an axle holder 34 in the inside space of the headrail 10 at the left side.

The blind body 20 can be the slat assembly of a Venetian blind, the curtain of a window covering, or the like. According to this embodiment, the blind body 20 is a curtain having its top side fixedly connected in parallel to the periphery of the axle 33.

When starting the driving mechanism 30 to rotate the axle 33, the axle 33 roll up/let off the blind body 20, i.e., the axle 33 moves the blind body 20 to change its shading status. Therefore, the axle 33 works as a power output device 36 that moves the blind body 20, and the reversible motor 32 works as a power input device 35 that moves the axle 33.

5           The control mechanism 40 comprises a hollow suspension rod 41 and a controller 42. The suspension rod 41 is vertically suspended from the headrail 10, having one end, namely, the top end fixedly connected to the headrail 10 corresponding to the reversible motor 32. The controller 42 comprises a handheld box 43 fixedly fastened to the other end, namely, the bottom end of the suspension rod 41  
10   accessible to the hand of a person. As shown in FIG. 2, the handheld box 43 houses a circuit board 44, which controls rotation (forward/backward rotation) and stoppage of the reversible motor 32, and a battery set 45 electrically coupled to the circuit board 44. The circuit board 44 has power input contacts (not shown). The battery set 45 has power output contacts (not shown). When inserted the battery set 45 into the handheld  
15   box 43, the power output contacts of the battery set 45 are respectively maintained in contact with the power input contacts of the circuit board 44, and therefore battery power is linked to the circuit board 44. Lead wires 46 are inserted through the suspension rod 41 and electrically connected between the circuit board 44 and the reversible motor 32. The handheld box 43 has control switches 47 located on the  
20   outside for controlling the operation mode of the circuit board 44, and a detachable battery lid 48 corresponding to the battery set 45. When detached the battery lid 48 from the handheld box 43, the battery set 45 can easily be removed from the handheld box 43 for a replacement.

          After detailed description of the structure and relative positioning of the parts  
25   of the first embodiment of the present invention, the operation of the

electricity-operated window blind 100 is outlined hereinafter.

When wishing to change the shading status of the blind body 20, the user can directly operate the control switches 47 of the controller 42 to rotate the reversible motor 32 forwards or backwards, or to stop the reversible motor 32, thereby causing  
5 the shading status of the blind body 20 to be relatively changed. When the power of the battery set 45 of the controller 42 used up, the user can then open the battery lid 48 and then replace the battery set 45. After installation of a new battery set, the battery lid 48 is closed again.

Because the suspension rod 41 holds the controller 42 at an elevation  
10 accessible to the hand of a person, the user can conveniently operate the controller 42 to control the shading status of the blind body 20. When battery low, the user can conveniently replace the battery set 45.

FIGS. 3 and 4 show an electricity-operated window blind 200 constructed according to the second preferred embodiment of the present invention. According to  
15 this embodiment, the electricity-operated window blind 200 comprises a headrail 50, a blind body 60, a driving mechanism 70, and a control mechanism 80. The headrail 50 and the blind body 60 are substantially similar to the like members in the aforesaid first embodiment. The main features of this second embodiment are outlined hereinafter.

The driving mechanism 70 comprises a motor drive 71 and a coupling device  
20 75. The motor drive 71 comprises a reversible motor 72 installed in the right side inside the headrail 50, and an axle 73 coupled to the rotor (output shaft) of the reversible motor 72 and pivotally supported in an axle holder 74 in the left side inside the headrail 50. The coupling device 75 is made of electrically insulative material and fixedly fastened to the headrail 50, having a part extended out of the right bottom side  
25 of the headrail 50. The coupling device 75 comprises connecting means 76 and

terminals 78. According to this embodiment, the connecting means 76 is an inner thread 77. The terminals 78 are located on the top side of the coupling device 75, and electrically coupled to the reversible motor 72. According to this embodiment, the axle 73 works as a power output device 791, and the reversible motor 72 and the coupling device 75 form a power input device 792 adapted to receive electric energy and to rotate the power output device 791.

The control mechanism 80 comprises a hollow suspension rod 81 and a controller 82. The suspension rod 81 is a hollow rod member of a predetermined length, having one end connected to the controller 82 and the other end provided with terminals 83. The suspension rod 81 has coupling means 84. According to this embodiment, the coupling means 84 is an outer thread 841 extended around the periphery of the end where the terminals 83 are provided. The outer thread 841 can be threaded into the inner thread 77 to force the terminals 83 into contact with the terminals 78. Lead wires 86 are inserted into the suspension rod 81 and electrically connected between the terminals 83 and the circuit board 85 of the controller 82. The circuit board 85 has a wireless receiving circuit adapted to receive control signal from a remote controller 87.

When in use, the outer thread 841 of the suspension rod 81 is threaded into the inner thread 77 of the coupling device 75 to force the terminals 83 into contact with the terminals 78, thereby causing the reversible motor 72 to be electrically coupled to the circuit board 85, i.e., the terminals 78 of the coupling device 75 and the terminals 83 of the suspension rod 81 form a first interface and a second interface between the battery set 88 of the controller 82 and the reversible motor 72, for enabling battery power supply to be provided by the battery set 88 to the reversible motor 72. The user may operate the control switches 89 of the controller 82 to drive the circuit board 85 to

start/stop the reversible motor 72. Alternatively, the user can directly use the remote controller 87 to control the operation of the circuit board 85 at a remote place.

Further, when the blind body 60 moved to the desired position, the user can then disconnect the suspension rod 81 from the coupling device 74 and have the control mechanism 80 separately stored in a storage place, keeping the outer appearance of the window blind neat and clean.

FIG. 5 shows an electricity-operated window blind 300 constructed according to the third preferred embodiment of the present invention. This embodiment is substantially similar to the aforesaid second embodiment of the present invention with exceptions outlined hereinafter.

The power input device 91 of the driving mechanism 90 is formed of a reversible motor 911 and a hexagonal rod member 912, which serve as the input device 91. The reversible motor 911 is mounted inside the headrail 10'. The hexagonal rod member 912 is installed in the headrail 10', having a bottom side extended out of the headrail 10' toward the operation position of the user and a coupling portion 92, for example, a V-groove 921 extended around the periphery near the bottom side, and a plurality of contacts 922 in the bottom edge of the bottom side.

The suspension rod 94 of the control mechanism 93 has a hexagonal coupling hole 941 in the top end, and retaining means 95 in the hexagonal coupling hole 941. According to this embodiment, the retaining means 95 comprises a plurality of spring strips 951 vertically located on the peripheral wall of the hexagonal coupling hole 941, each having a smoothly arched protruding portion 952 projecting toward the central axis of the hexagonal coupling hole 941. The suspension rod 94 further has a plurality of terminals 953 respectively installed in the hexagonal coupling hole 941 and electrically connected to the battery set (not shown) of the controller (not shown) by

lead wires 98. The circuit board 97 of the controller is mounted inside the headrail 10' and electrically connected to the reversible motor 911. Lead wires 96 are inserted through the power input device 91 to electrically connect the circuit board 97 to the contacts 922.

5           When in use, the user lift the suspension rod 94 to force the hexagonal coupling hole 941 into engagement with the power input device 91 of the driving mechanism 90. At this time, the smoothly arched protruding portions 952 of the spring strips 951 are respectively forced into engagement with the V-groove 921, keeping the suspension rod 94 firmly connected to the power input device 91. At this time, the  
10   contacts 922 of the hexagonal rod member 912 are maintained in contact with the terminals 953 in the hexagonal coupling hole 941, for enabling battery power supply to be transmitted from the controller through the lead wires 98, 96 to the circuit board 97 and then the reversible motor 911. Further, because the spring strips 951 are deformable, the user can employ a force to the suspension rod 94, keeping the  
15   suspension rod 94 connected to or disconnected from the power input device 91.